# Balanced Potassium Nutrition for Plant Disease Management

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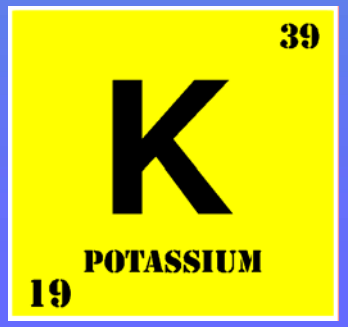
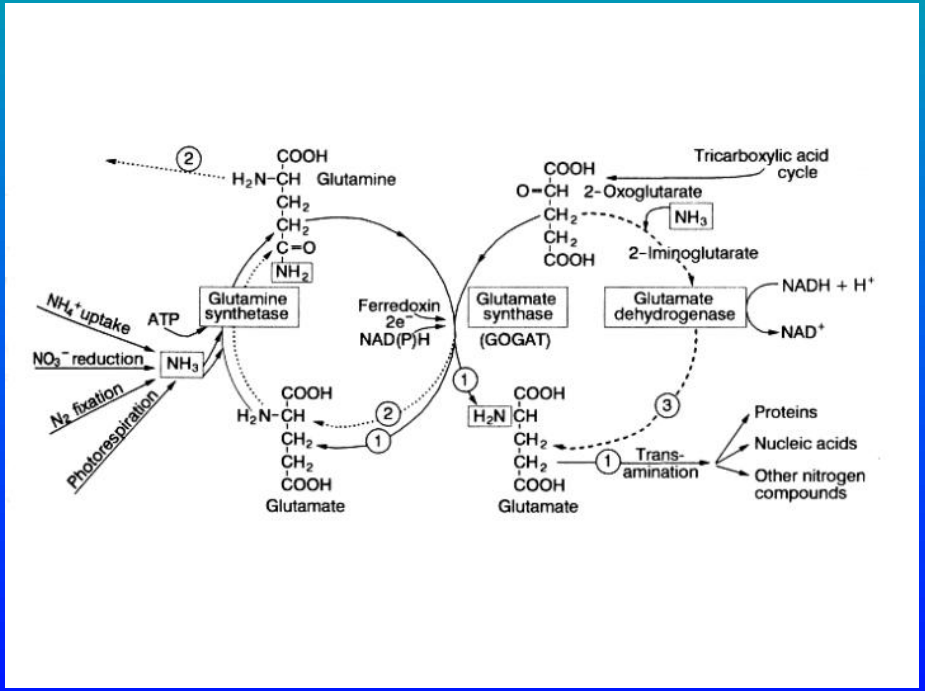


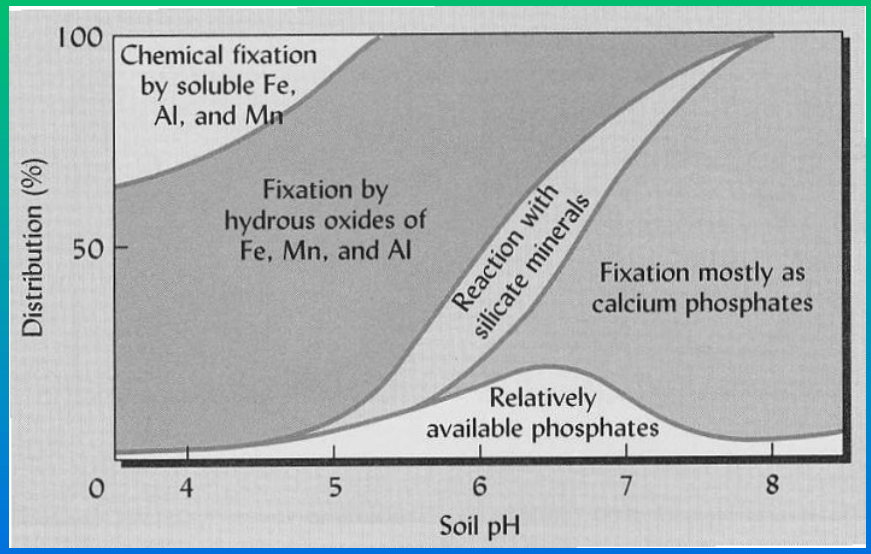
# Mineral Nutrition

- Enzyme activators
- Structural components
- Metabolic regulators
- Substrates



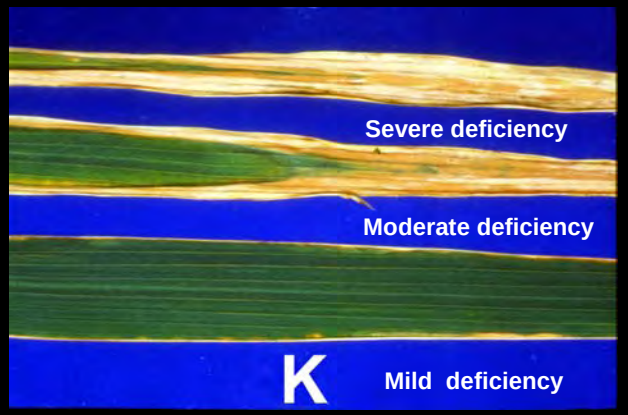
# Availability to the Plant

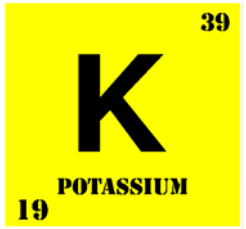
- Soil texture
- pH
- Moisture
- Temperature
- Mineral solubility
- Soil retention
- Soil microbial activity
- Ability of the plant to use nutrients efficiently



# Nutritional Status of the Plant

- Inherent disease resistance
- Altered pathogenesis
- Ability of the pathogen to survive



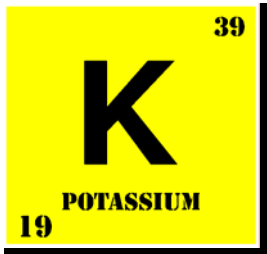



# Nutrient Host Relationships


- **Potassium / rice**

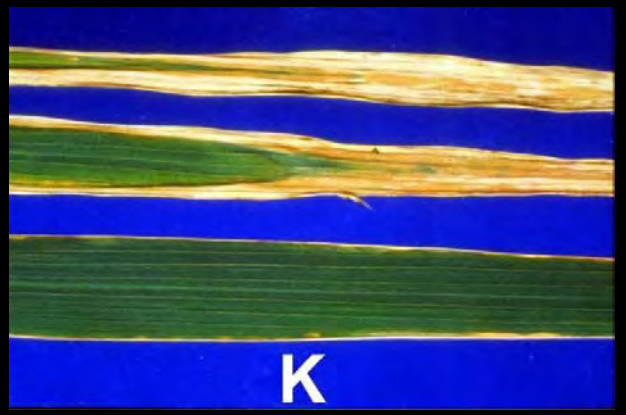

## Sufficient K Concentrations (mg K/g DM)

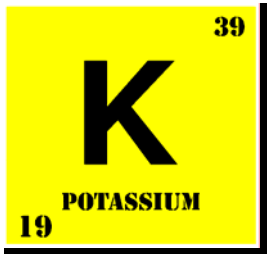
| Rice before anthesis | Wheat |
|---|---|
| 20-30 | 35-55 |




# Essential Roles of K in Plant Nutrition

- Increases root growth
- Improves water and nutrient uptake
- Builds cellulose and reduces lodging
- Enhances and regulates 60 different enzymes
- Reduces respiration to prevent energy loss
- Aids in photosynthesis
- Helps translocation of sugars and starch
- Increases protein content
- Maintain turgor
- Reduces water loss and wilting
- Helps suppress plant diseases





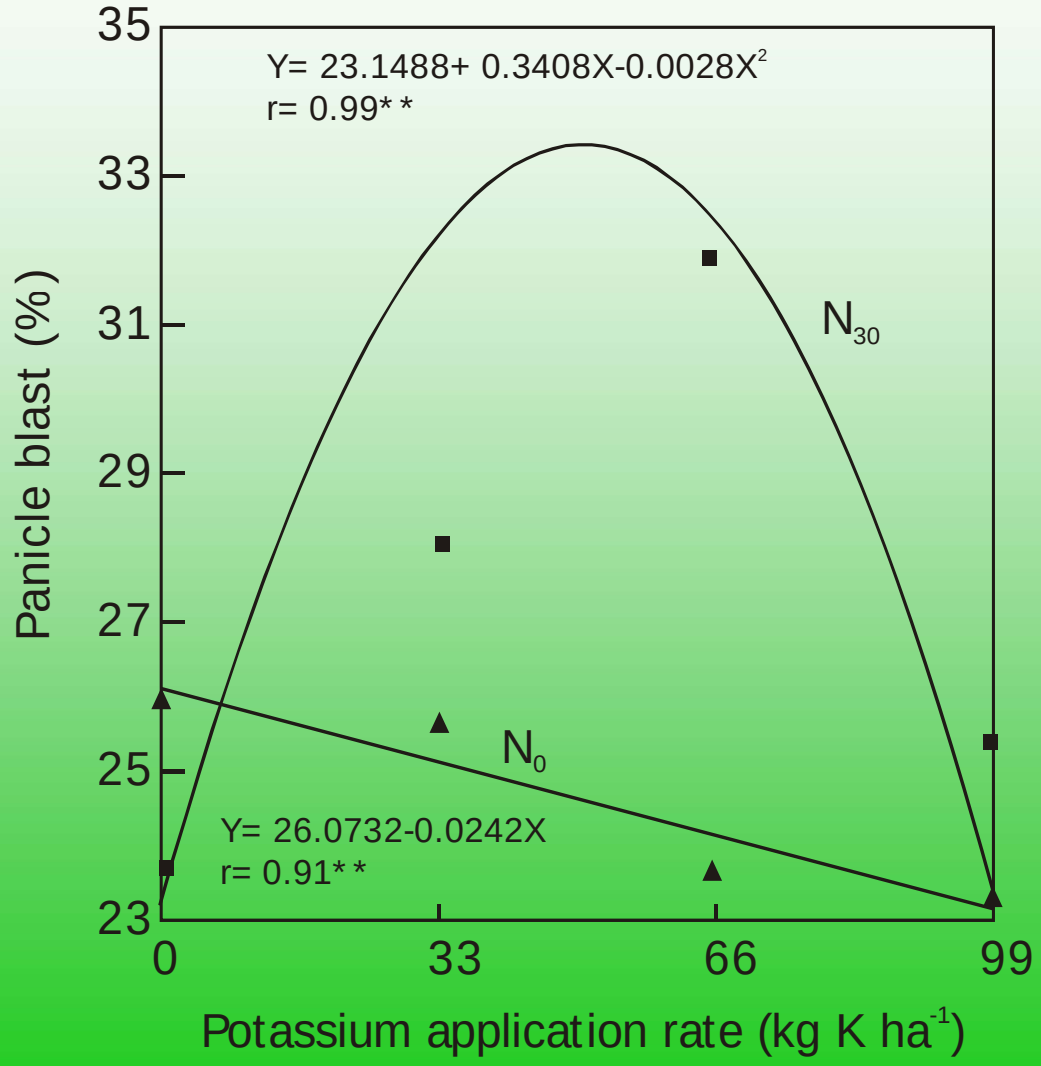

# Effect of K on plant disease development

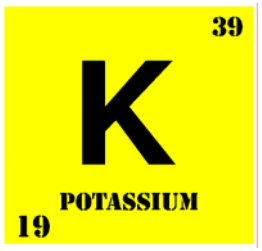
| Group of Disease | Number of articles showing the effect of potassium on disease[1] | | | |
|---|---|---|---|---|
| | Decreased | Increased | No effect | Total |
| Fungal | 89 | 33 | 8 | 130 |
| Bacterial | 19 | 5 | * | 24 |
| Viruses | 9 | 5 | 3 | 17 |
| Nematodes | 3 | 6 | 1 | 10 |

[1] Data compiled from Huber & Arny (1985) with additional articles.

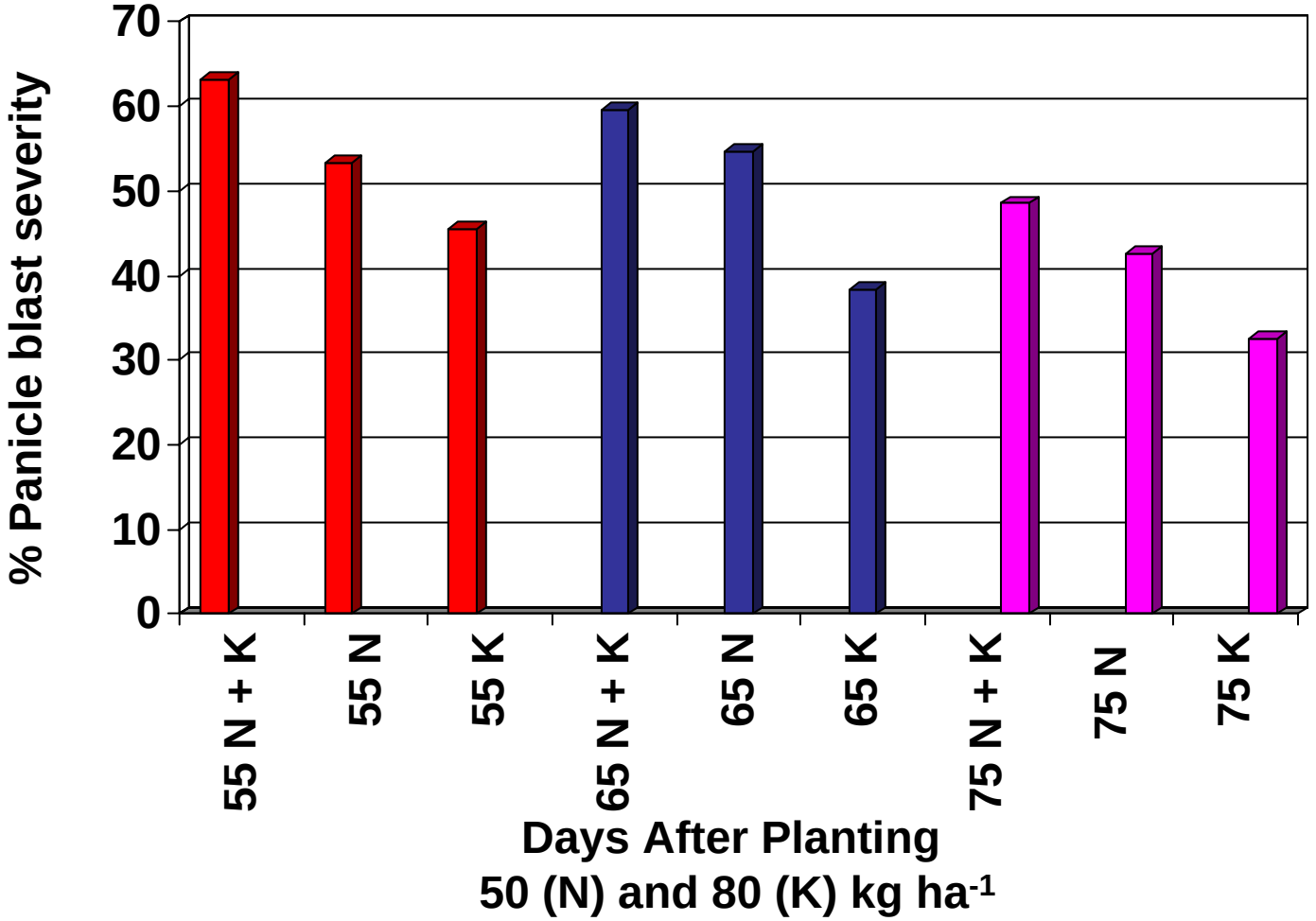
* Data not available

Effect of potassium fertilization on panicle blast at two nitrogen (N) levels in upland rice ($N_0$ = ▲; $N_{30}$ = ■). The regression equations were calculated using fertilizer application rates expressed as $K_2O$.

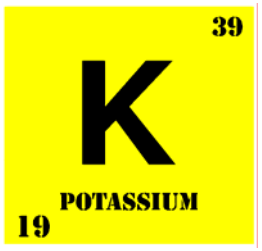




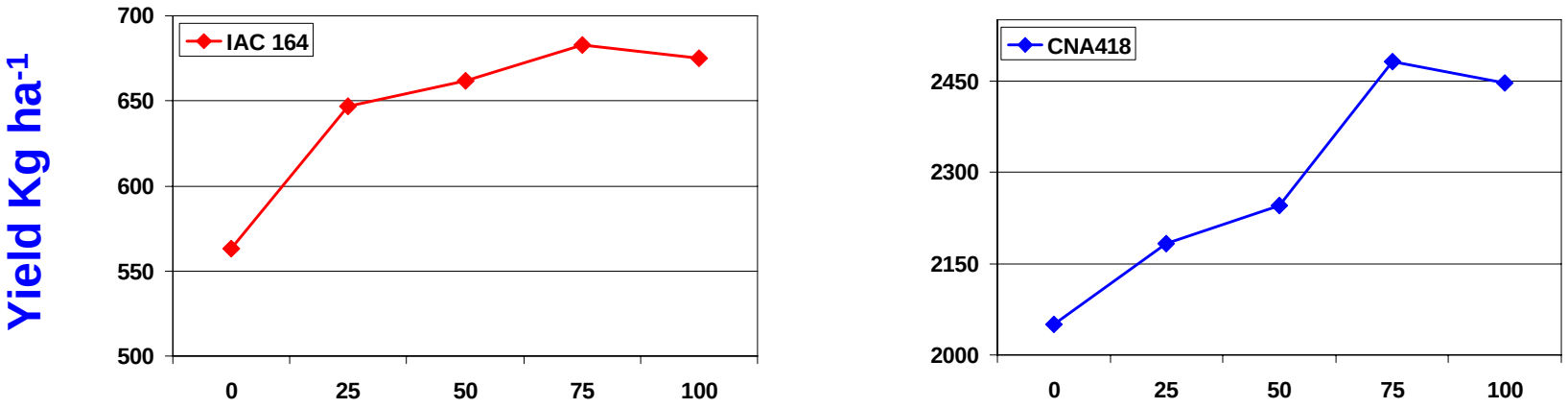

# Panicle blast severity in relation to application time of N and K in upland rice

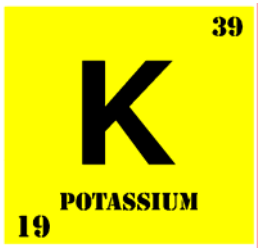



Prabhu and Silva, 2004




# Grain yield of susceptible and resistant rice cultivars to blast in relation to applied potassium



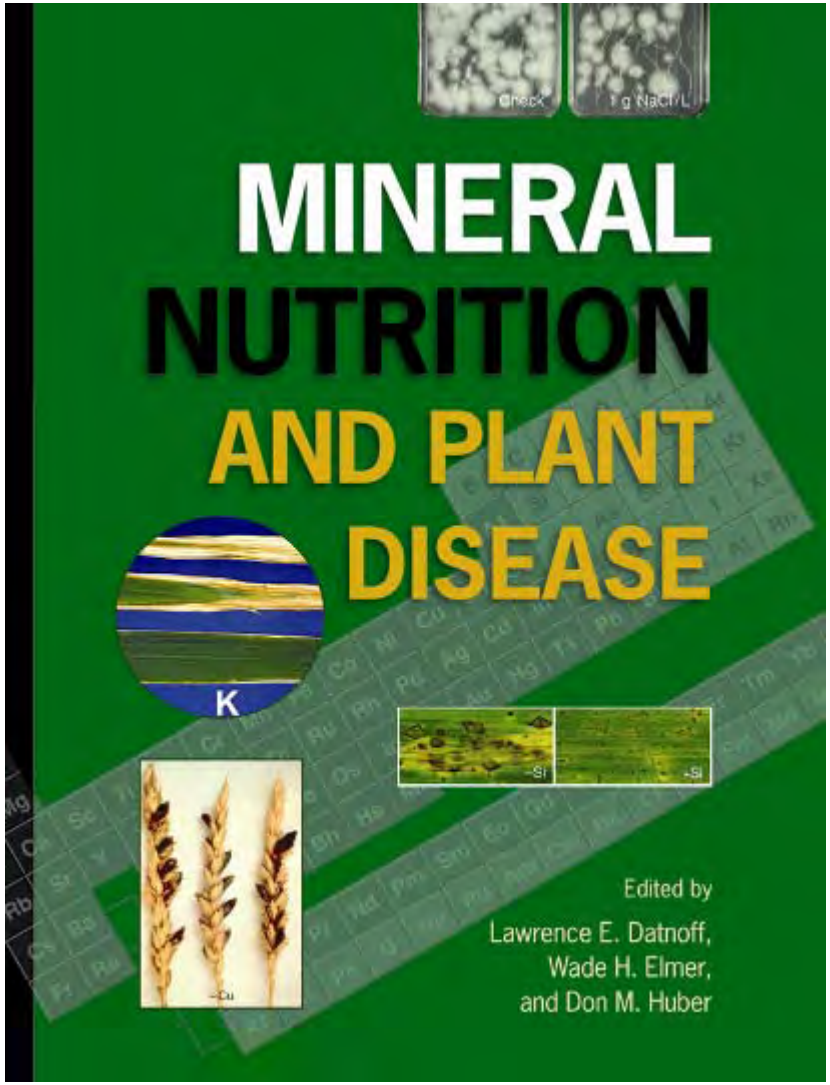



# How K suppresses plant disease

- Alterations in protein or amino acids
- Decreased cell permeability
- Decreased susceptibility of tissue to maceration and penetration


# Conclusions

- Potassium is important for plant health especially when the plant is low or deficient and/or under some adverse environmental stress
- Large gaps still exist in understanding its ratio to other key elements in plant tissue
- More research is needed to understand adequate rates and application times for this element to improve plant utilization and subsequently plant production and health

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